iAP20 Rec'd PCT/PTO 05 JUN 2006

SEQUENCE LISTING

<110> National Institutes of Health

5   Qasba, Pradman

        Boeggeman, Elizabeth

        Ramakrishnan, Boopathy

<120> Catalytic Domains Of Beta(1,4)-Galactosyltransferase I Having

10   Altered Metal Ion Specificity

<130> 1662.027WO1

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20<212> PRT

<213> Homo sapiens

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Cys Arg Met Ile Arg His

25 1   5

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<211> 7

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30<213> Homo sapiens

<400> 2

Phe Asn Arg Ala Lys Leu Leu

    1   5

35

<210> 3

<211> 7

<212> PRT

<213> Homo sapiens

40

<400> 3

Tyr Val Gln Tyr Phe Gly Gly

    1   5

2

<210> 4
<211> 398
<212> PRT
<213> Homo sapiens

5

<400> 4

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Ala Ser Leu Gln Arg Ala Cys Arg Leu Leu Val Ala Val Cys Ala Leu
10              20              25              30
His Leu Gly Val Thr Leu Val Tyr Tyr Leu Ala Gly Arg Asp Leu Ser
                35              40              45
Arg Leu Pro Gln Leu Val Gly Val Ser Thr Pro Leu Gln Gly Gly Ser
        50              55              60
15Asn Ser Ala Ala Ala Ile Gly Gln Ser Ser Gly Asp Leu Arg Thr Gly
    65              70              75              80
Gly Ala Arg Pro Pro Pro Leu Gly Ala Ser Ser Gln Pro Arg Pro
                85              90              95
Gly Gly Asp Ser Ser Pro Val Val Asp Ser Gly Pro Gly Pro Ala Ser
20          100             105             110
Asn Leu Thr Ser Val Pro Val Pro His Thr Thr Ala Leu Ser Leu Pro
        115             120             125
Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met Leu Ile Glu
        130             135             140
25Phe Asn Met Pro Val Asp Leu Glu Leu Val Ala Lys Gln Asn Pro Asn
    145             150             155             160
Val Lys Met Gly Gly Arg Tyr Ala Pro Arg Asp Cys Val Ser Pro His
                165             170             175
Lys Val Ala Ile Ile Ile Pro Phe Arg Asn Arg Gln Glu His Leu Lys
30          180             185             190
Tyr Trp Leu Tyr Tyr Leu His Pro Val Leu Gln Arg Gln Gln Leu Asp
        195             200             205
Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Asp Thr Ile Phe Asn Arg
        210             215             220
35Ala Lys Leu Leu Asn Val Gly Phe Gln Glu Ala Leu Lys Asp Tyr Asp
    225             230             235             240
Tyr Thr Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro Met Asn Asp
                245             250             255
His Asn Ala Tyr Arg Cys Phe Ser Gln Pro Arg His Ile Ser Val Ala
40          260             265             270
Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr Phe Gly Gly
        275             280             285
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Val Ser Ala Ser Ser Lys Gln Gln Phe Leu Thr Ile Asn Gly Phe Pro
          290   295   300

Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile Phe Asn Arg
    305   310   315   320

5Leu Val Phe Arg Gly Met Ser Ile Ser Arg Pro Asn Ala Val Val Gly
                    325   330   335

Thr Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn Glu Pro Asn
              340   345   350

Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr Met Leu Ser
10   355   360   365

Asp Gly Leu Asn Ser Leu Thr Tyr Gln Val Leu Asp Val Gln Arg Tyr
          370   375   380

Pro Leu Tyr Thr Gln Ile Thr Val Asp Ile Gly Thr Pro Ser
385   390   395

15
    <210> 5
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    <212> PRT
    <213> Mus musculus
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    <400> 5
    Met Arg Phe Arg Glu Gln Phe Leu Gly Gly Ser Ala Ala Met Pro Gly
      1   5   10   15

    Ala Thr Leu Gln Arg Ala Cys Arg Leu Leu Val Ala Val Cys Ala Leu
25   20   25   30

    His Leu Gly Val Thr Leu Val Tyr Tyr Leu Ser Gly Arg Asp Leu Ser
              35   40   45

    Arg Leu Pro Gln Leu Val Gly Val Ser Ser Thr Leu Gln Gly Gly Thr
          50   55   60

30Asn Gly Ala Ala Ala Ser Lys Gln Pro Pro Gly Glu Gln Arg Pro Arg
    65   70   75   80

    Gly Ala Arg Pro Pro Pro Leu Gly Val Ser Pro Lys Pro Arg Pro
                    85   90   95

    Gly Leu Asp Ser Ser Pro Gly Ala Ala Ser Gly Pro Gly Leu Lys Ser
35   100   105   110

    Asn Leu Ser Ser Leu Pro Val Pro Thr Thr Thr Gly Leu Leu Ser Leu
              115   120   125

    Pro Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met Leu Ile
          130   135   140

40Asp Phe Asn Ile Ala Val Asp Leu Glu Leu Leu Ala Lys Lys Asn Pro
    145   150   155   160

4

```
Glu Ile Lys Thr Gly Gly Arg Tyr Ser Pro Lys Asp Cys Val Ser Pro
                165             170             175
His Lys Val Ala Ile Ile Ile Pro Phe Arg Asn Arg Gln Glu His Leu
            180             185             190
5Lys Tyr Trp Leu Tyr Tyr Leu His Pro Ile Leu Gln Arg Gln Gln Leu
            195             200             205
Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Asp Thr Met Phe Asn
        210             215             220
Arg Ala Lys Leu Leu Asn Ile Gly Phe Gln Glu Ala Leu Lys Asp Tyr
10225             230             235             240
Asp Tyr Asn Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro Met Asp
                245             250             255
Asp Arg Asn Ala Tyr Arg Cys Phe Ser Gln Pro Arg His Ile Ser Val
            260             265             270
15Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr Phe Gly
            275             280             285
Gly Val Ser Ala Leu Ser Lys Gln Gln Phe Leu Ala Ile Asn Gly Phe
        290             295             300
Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile Phe Asn
20305             310             315             320
Arg Leu Val His Lys Gly Met Ser Ile Ser Arg Pro Asn Ala Val Val
                325             330             335
Gly Arg Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn Glu Pro
            340             345             350
25Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr Met Arg
            355             360             365
Phe Asp Gly Leu Asn Ser Leu Thr Tyr Lys Val Leu Asp Val Gln Arg
        370             375             380
Tyr Pro Leu Tyr Thr Gln Ile Thr Val Asp Ile Gly Thr Pro Arg
30385             390             395
```

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<210> 6
<211> 402
<212> PRT
35<213> Bos taurus

<400> 6
Met Lys Phe Arg Glu Pro Leu Leu Gly Gly Ser Ala Ala Met Pro Gly
1               5               10              15
40Ala Ser Leu Gln Arg Ala Cys Arg Leu Leu Val Ala Val Cys Ala Leu
            20              25              30
```

5

His Leu Gly Val Thr Leu Val Tyr Tyr Leu Ala Gly Arg Asp Leu Arg
         35   40   45

Arg Leu Pro Gln Leu Val Gly Val His Pro Pro Leu Gln Gly Ser Ser
     50   55   60

5His Gly Ala Ala Ala Ile Gly Gln Pro Ser Gly Glu Leu Arg Leu Arg
  65   70   75   80

Gly Val Ala Pro Pro Pro Leu Gln Asn Ser Ser Lys Pro Arg Ser
             85   90   95

Arg Ala Pro Ser Asn Leu Asp Ala Tyr Ser His Pro Gly Pro Gly Pro
10   100   105   110

Gly Pro Gly Ser Asn Leu Thr Ser Ala Pro Val Pro Ser Thr Thr Thr
        115   120   125

Arg Ser Leu Thr Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro
     130   135   140

15Met Leu Ile Glu Phe Asn Ile Pro Val Asp Leu Lys Leu Ile Glu Gln
  145   150   155   160

Gln Asn Pro Lys Val Lys Leu Gly Gly Arg Tyr Thr Pro Met Asp Cys
          165   170   175

Ile Ser Pro His Lys Val Ala Ile Ile Ile Leu Phe Arg Asn Arg Gln
20   180   185   190

Glu His Leu Lys Tyr Trp Leu Tyr Tyr Leu His Pro Met Val Gln Arg
        195   200   205

Gln Gln Leu Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Glu Ser
     210   215   220

25Met Phe Asn Arg Ala Lys Leu Leu Asn Val Gly Phe Lys Glu Ala Leu
  225   230   235   240

Lys Asp Tyr Asp Tyr Asn Cys Phe Val Phe Ser Asp Val Asp Leu Ile
          245   250   255

Pro Met Asn Asp His Asn Thr Tyr Arg Cys Phe Ser Gln Pro Arg His
30   260   265   270

Ile Ser Val Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln
     275   280   285

Tyr Phe Gly Gly Val Ser Ala Leu Ser Lys Gln Gln Phe Leu Ser Ile
        290   295   300

35Asn Gly Phe Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp
  305   310   315   320

Ile Tyr Asn Arg Leu Ala Phe Arg Gly Met Ser Val Ser Arg Pro Asn
          325   330   335

Ala Val Ile Gly Lys Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys
40   340   345   350

Asn Glu Pro Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu
     355   360   365

Thr Met Leu Ser Asp Gly Leu Asn Ser Leu Thr Tyr Met Val Leu Glu
     370   375   380

Val Gln Arg Tyr Pro Leu Tyr Thr Lys Ile Thr Val Asp Ile Gly Thr
385   390   395   400

5 Pro Ser

<210> 7
<211> 113
10 <212> PRT
<213> Homo sapiens

<400> 7

Arg Asp Leu Ser Arg Leu Pro Gln Leu Val Gly Val Ser Thr Pro Leu
15 1   5   10   15

Gln Gly Gly Ser Asn Ser Ala Ala Ala Ile Gly Gln Ser Ser Gly Asp
          20   25   30

Leu Arg Thr Gly Gly Ala Arg Pro Pro Pro Leu Gly Ala Ser Ser
        35   40   45

20 Gln Pro Arg Pro Gly Gly Asp Ser Ser Pro Val Val Asp Ser Gly Pro
    50   55   60

Gly Pro Ala Ser Asn Leu Thr Ser Val Pro Val Pro His Thr Thr Ala
65   70   75   80

Leu Ser Leu Pro Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro
25   85   90   95

Met Leu Ile Glu Phe Asn Met Pro Val Asp Leu Glu Leu Val Ala Lys
        100   105   110

Gln

30

<210> 8
<211> 85
<212> PRT
<213> Bos taurus

35

<400> 8

Arg Asp Leu Arg Arg Leu Pro Gln Leu Val Gly Val His Pro Pro Leu
1   5   10   15

Gln Gly Ser Ser His Gly Ala Ala Ala Ile Gly Gln Pro Ser Gly Glu
40   20   25   30

Leu Arg Leu Arg Gly Val Ala Pro Pro Pro Pro Leu Gln Asn Ser Ser
        35   40   45

```
Lys Pro Arg Ser Arg Ala Pro Ser Asn Leu Asp Ala Tyr Ser His Pro
     50                  55                  60
Gly Pro Gly Pro Gly Pro Gly Ser Asn Leu Thr Ser Ala Pro Val Pro
 65                  70                  75                  80
5Ser Thr Thr Thr Arg
                  85


   <210> 9
   <211> 273
10<212> PRT
   <213> Homo sapiens


   <400> 9
   Ser Leu Pro Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met
15 1                ·5                  10                  15
   Leu Ile Glu Phe Asn Met Pro Val Asp Leu Glu Leu Val Ala Lys Gln
                 20                  25                  30
   Asn Pro Asn Val Lys Met Gly Gly Arg Tyr Ala Pro Arg Asp Cys Val
                 35                  40                  45
20Ser Pro His Lys Val Ala Ile Ile Ile Pro Phe Arg Asn Arg Gln Glu
       50                  55                  60
   His Leu Lys Tyr Trp Leu Tyr Tyr Leu His Pro Val Leu Gln Arg Gln
    65                  70                  75                  80
   Gln Leu Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Asp Thr Ile
25                  85                  90                  95
   Phe Asn Arg Ala Lys Leu Leu Asn Val Gly Phe Gln Glu Ala Leu Lys
                100                 105                 110
   Asp Tyr Asp Tyr Thr Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro
             115                 120                 125
30Met Asn Asp His Asn Ala Tyr Arg Cys Phe Ser Gln Pro Arg His Ile
       130                 135                 140
   Ser Val Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr
   145                 150                 155                 160
 · Phe Gly Gly Val Ser Ala Ser Ser Lys Gln Gln Phe Leu Thr Ile Asn
35                  165                 170                 175
   Gly Phe Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile
            180                 185                 190
   Phe Asn Arg Leu Val Phe Arg Gly Met Ser Ile Ser Arg Pro Asn Ala
             195                 200                 205
40Val Val Gly Thr Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn
       210                 215                 220
```

8

Glu Pro Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr
225   230   235   240
Met Leu Ser Asp Gly Leu Asn Ser Leu Thr Tyr Gln Val Leu Asp Val
              245   250   255
5Gln Arg Tyr Pro Leu Tyr Thr Gln Ile Thr Val Asp Ile Gly Thr Pro
              260   265   270
Ser

10<210> 10
   <211> 273
   <212> PRT
   <213> Bos taurus

15<400> 10
   Ser Leu Thr Ala Cys Pro Glu Glu Ser Pro Leu Leu Val Gly Pro Met
   1   5   10   15
   Leu Ile Glu Phe Asn Ile Pro Val Asp Leu Lys Leu Ile Glu Gln Gln
                 20   25   30
20Asn Pro Lys Val Lys Leu Gly Gly Arg Tyr Thr Pro Met Asp Cys Ile
              35   40   45
   Ser Pro His Lys Val Ala Ile Ile Ile Leu Phe Arg Asn Arg Gln Glu
         50   55   60
   His Leu Lys Tyr Trp Leu Tyr Tyr Leu His Pro Met Val Gln Arg Gln
2565   70   75   80
   Gln Leu Asp Tyr Gly Ile Tyr Val Ile Asn Gln Ala Gly Glu Ser Met
                 85   90   95
   Phe Asn Arg Ala Lys Leu Leu Asn Val Gly Phe Lys Glu Ala Leu Lys
                 100   105   110
30Asp Tyr Asp Tyr Asn Cys Phe Val Phe Ser Asp Val Asp Leu Ile Pro
              115   120   125
   Met Asn Asp His Asn Thr Tyr Arg Cys Phe Ser Gln Pro Arg His Ile
              130   135   140
   Ser Val Ala Met Asp Lys Phe Gly Phe Ser Leu Pro Tyr Val Gln Tyr
35145   150   155   160
   Phe Gly Gly Val Ser Ala Leu Ser Lys Gln Gln Phe Leu Ser Ile Asn
                    165   170   175
   Gly Phe Pro Asn Asn Tyr Trp Gly Trp Gly Gly Glu Asp Asp Asp Ile
              180   185   190
40Tyr Asn Arg Leu Ala Phe Arg Gly Met Ser Val Ser Arg Pro Asn Ala
              195   200   205

9

Val Ile Gly Lys Cys Arg Met Ile Arg His Ser Arg Asp Lys Lys Asn
    210   215   220

Glu Pro Asn Pro Gln Arg Phe Asp Arg Ile Ala His Thr Lys Glu Thr
    225   230   235   240

5Met Leu Ser Asp Gly Leu Asn Ser Leu Thr Tyr Met Val Leu Glu Val
              245   250   255

Gln Arg Tyr Pro Leu Tyr Thr Lys Ile Thr Val Asp Ile Gly Thr Pro
              260   265   270

Ser
10

<210> 11
<211> 1197
<212> PRT
15<213> Homo sapiens

<400> 11
Ala Thr Gly Ala Gly Gly Cys Thr Thr Cys Gly Gly Gly Ala Gly Cys
    1   5   10   15
20Cys Gly Cys Thr Cys Cys Thr Gly Ala Gly Cys Cys Gly Gly Ala Gly
              20   25   30
Cys Gly Cys Cys Gly Cys Gly Ala Thr Gly Cys Cys Ala Gly Gly Cys
    35   40   45
Gly Cys Gly Thr Cys Cys Cys Thr Ala Cys Ala Gly Cys Gly Gly Gly
25 50   55   60
Cys Cys Thr Gly Cys Cys Gly Cys Cys Thr Gly Cys Thr Cys Gly Thr
65   70   75   80
Gly Gly Cys Cys Gly Thr Cys Thr Gly Cys Gly Cys Thr Cys Thr Gly
              85   90   95
30Cys Ala Cys Cys Thr Thr Gly Gly Cys Gly Thr Cys Ala Cys Cys Cys
        100   105   110
Thr Cys Gly Thr Thr Thr Ala Cys Thr Ala Cys Cys Thr Gly Gly Cys
        115   120   125
Thr Gly Gly Cys Cys Gly Cys Gly Ala Cys Cys Thr Gly Ala Gly Cys
35 130   135   140
Cys Gly Cys Cys Thr Gly Cys Cys Cys Cys Ala Ala Cys Thr Gly Gly
    145   150   155   160
Thr Cys Gly Gly Ala Gly Thr Cys Thr Cys Cys Ala Cys Ala Cys Cys
              165   170   175
40Gly Cys Thr Gly Cys Ala Gly Gly Gly Cys Gly Gly Gly Thr Cys Gly
              180   185   190

10

Ala Ala Cys Ala Gly Thr Gly Cys Cys Gly Cys Cys Gly Cys Cys Ala
            195   200   205

Thr Cys Gly Gly Gly Cys Ala Gly Thr Cys Cys Thr Cys Cys Gly Gly
        210   215   220

5Gly Gly Ala Cys Cys Thr Cys Cys Gly Gly Ala Cys Cys Gly Gly Ala
    225   230   235   240

Gly Gly Gly Gly Cys Cys Cys Gly Gly Cys Cys Gly Cys Cys Gly Cys
                245   250   255

Cys Thr Cys Cys Thr Cys Thr Ala Gly Gly Cys Gly Cys Cys Thr Cys
10   260   265   270

Cys Thr Cys Cys Cys Ala Gly Cys Cys Gly Cys Gly Cys Cys Cys Gly
        275   280   285

Gly Gly Thr Gly Gly Cys Gly Ala Cys Thr Cys Cys Ala Gly Cys Cys
    290   295   300

15Cys Ala Gly Thr Cys Gly Thr Gly Gly Ala Thr Thr Cys Thr Gly Gly
    305   310   315   320

Cys Cys Cys Thr Gly Gly Cys Cys Cys Cys Gly Cys Thr Ala Gly Cys
                325   330   335

Ala Ala Cys Thr Thr Gly Ala Cys Cys Thr Cys Gly Gly Thr Cys Cys
20   340   345   350

Cys Ala Gly Thr Gly Cys Cys Cys Ala Cys Ala Cys Cys Ala Cys
        355   360   365

Cys Gly Cys Ala Cys Thr Gly Thr Cys Gly Cys Thr Gly Cys Cys Cys
    370   375   380

25Gly Cys Cys Thr Gly Cys Cys Cys Thr Gly Ala Gly Gly Ala Gly Thr
    385   390   395   400

Cys Cys Cys Cys Gly Cys Thr Gly Cys Thr Thr Gly Thr Gly Gly Gly
                405   410   415

Cys Cys Cys Cys Ala Thr Gly Cys Thr Gly Ala Thr Thr Gly Ala Gly
30   420   425   430

Thr Thr Thr Ala Ala Cys Ala Thr Gly Cys Cys Thr Gly Thr Gly Gly
        435   440   445

Ala Cys Cys Thr Gly Gly Ala Gly Cys Thr Cys Gly Thr Gly Gly Cys
    450   455   460

35Ala Ala Ala Gly Cys Ala Gly Ala Ala Cys Cys Cys Ala Ala Ala Thr
    465   470   475   480

Gly Thr Gly Ala Ala Gly Ala Thr Gly Gly Gly Cys Gly Gly Cys Cys
            485   490   495

Gly Cys Thr Ala Thr Gly Cys Cys Cys Cys Ala Gly Gly Gly Ala
40   500   505   510

Cys Thr Gly Cys Gly Thr Cys Thr Cys Thr Cys Cys Thr Cys Ala Cys
        515   520   525

11

```
        Ala Ala Gly Gly Thr Gly Gly Cys Cys Ala Thr Cys Ala Thr Cys Ala
            530                 535                 540
        Thr Thr Cys Cys Ala Thr Thr Cys Cys Gly Cys Ala Ala Cys Cys Gly
            545                 550                 555                 560
      5 Gly Cys Ala Gly Gly Ala Gly Cys Ala Cys Cys Thr Cys Ala Ala Gly
                        565                 570                 575
        Thr Ala Cys Thr Gly Gly Cys Thr Ala Thr Ala Thr Thr Ala Thr Thr
                    580                 585                 590
        Thr Gly Cys Ala Cys Cys Cys Ala Gly Thr Cys Cys Thr Gly Cys Ala
     10         595                 600                 605
        Gly Cys Gly Cys Cys Ala Gly Cys Ala Gly Cys Thr Gly Gly Ala Cys
                610                 615                 620
        Thr Ala Thr Gly Gly Cys Ala Thr Cys Thr Ala Thr Gly Thr Thr Ala
     625                 630                 635                 640
     15 Thr Cys Ala Ala Cys Cys Ala Gly Gly Cys Gly Gly Gly Ala Gly Ala
                        645                 650                 655
        Cys Ala Cys Thr Ala Thr Ala Thr Thr Cys Ala Ala Thr Cys Gly Thr
                    660                 665                 670
        Gly Cys Thr Ala Ala Gly Cys Thr Cys Cys Thr Cys Ala Ala Thr Gly
     20         675                 680                 685
        Thr Thr Gly Gly Cys Thr Thr Thr Cys Ala Ala Gly Ala Ala Gly Cys
                690                 695                 700
        Cys Thr Thr Gly Ala Ala Gly Gly Ala Cys Thr Ala Thr Gly Ala Cys
     705                 710                 715                 720
     25 Thr Ala Cys Ala Cys Cys Thr Gly Cys Thr Thr Thr Gly Thr Gly Thr
                        725                 730                 735
        Thr Thr Ala Gly Thr Gly Ala Cys Gly Thr Gly Gly Ala Cys Cys Thr
                    740                 745                 750
        Cys Ala Thr Thr Cys Cys Ala Ala Thr Gly Ala Ala Thr Gly Ala Thr
     30         755                 760                 765
        Cys Ala Thr Ala Ala Thr Gly Cys Gly Thr Ala Cys Ala Gly Gly Thr
                770                 775                 780
        Gly Thr Thr Thr Thr Thr Cys Ala Cys Ala Gly Cys Cys Ala Cys Gly
     785                 790                 795                 800
     35 Gly Cys Ala Cys Ala Thr Thr Thr Cys Cys Gly Thr Thr Gly Cys Ala
                        805                 810                 815
        Ala Thr Gly Gly Ala Thr Ala Ala Gly Thr Thr Gly Gly Ala Thr
                820                 825                 830
        Thr Cys Ala Gly Cys Cys Thr Ala Cys Cys Thr Thr Ala Thr Gly Thr
     40         835                 840                 845
        Thr Cys Ala Gly Thr Ala Thr Thr Thr Thr Gly Gly Ala Gly Gly Thr
            850                 855                 860
```

12

```
    Gly Thr Cys Thr Cys Thr Gly Cys Thr Thr Cys Ala Ala Gly Thr Ala
    865             870             875                 880
    Ala Ala Cys Ala Ala Cys Ala Gly Thr Thr Thr Cys Thr Ala Ala Cys
            885             890             895
  5Cys Ala Thr Cys Ala Ala Thr Gly Gly Ala Thr Thr Thr Cys Cys Thr
            900             905             910
    Ala Ala Thr Ala Ala Thr Thr Ala Thr Thr Gly Gly Gly Gly Cys Thr
          915             920             925
    Gly Gly Gly Gly Ala Gly Gly Ala Gly Ala Ala Gly Ala Thr Gly Ala
 10    930             935             940
    Thr Gly Ala Cys Ala Thr Thr Thr Thr Ala Ala Cys Ala Gly Ala
    945             950             955                 960
    Thr Thr Ala Gly Thr Thr Thr Thr Thr Ala Gly Ala Gly Gly Cys Ala
              965             970             975
  15Thr Gly Thr Cys Thr Ala Thr Ala Thr Cys Thr Cys Gly Cys Cys Cys
            980             985             990
    Ala Ala Ala Thr Gly Cys Thr Gly Thr Gly Gly Thr Cys Gly Gly Gly
          995             1000            1005
    Ala Cys Gly Thr Gly Thr Cys Gly Cys Ala Thr Gly Ala Thr Cys Cys
 20   1010            1015            1020
    Gly Cys Cys Ala Cys Thr Cys Ala Ala Gly Ala Gly Ala Cys Ala Ala
   1025            1030            1035            1040
    Gly Ala Ala Ala Ala Ala Thr Gly Ala Ala Cys Cys Cys Ala Ala Thr
              1045            1050            1055
  25Cys Cys Thr Cys Ala Gly Ala Gly Gly Thr Thr Thr Gly Ala Cys Cys
            1060            1065            1070
    Gly Ala Ala Thr Thr Gly Cys Ala Cys Ala Cys Ala Cys Ala Ala Ala
          1075            1080            1085
    Gly Gly Ala Gly Ala Cys Ala Ala Thr Gly Cys Thr Cys Thr Cys Thr
 30   1090            1095            1100
    Gly Ala Thr Gly Gly Thr Thr Thr Gly Ala Ala Cys Thr Cys Ala Cys
   1105            1110            1115            1120
    Thr Cys Ala Cys Cys Thr Ala Cys Cys Ala Gly Gly Thr Gly Cys Thr
                1125            1130            1135
  35Gly Gly Ala Thr Gly Thr Ala Cys Ala Gly Ala Gly Ala Thr Ala Cys
              1140            1145            1150
    Cys Cys Ala Thr Thr Gly Thr Ala Thr Ala Cys Cys Cys Ala Ala Ala
            1155            1160            1165
    Thr Cys Ala Cys Ala Gly Thr Gly Gly Ala Cys Ala Thr Cys Gly Gly
 40   1170            1175            1180
    Gly Ala Cys Ala Cys Cys Gly Ala Gly Cys Thr Ala Gly
   1185            1190            1195
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    <210> 12
    <211> 36
    <212> DNA
    <213> Artificial Sequence
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    <220>
    <223> A synthetic primer


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10atcgggaaga cgcgtcacat ccgccactcg agagac                                    36


    <210> 13
    <211> 36
    <212> DNA
15<213> Artificial Sequence


    <220>
    <223> A synthetic primer


20<400> 13
   atcgggaaga cgcgtgagat ccgccactcg agagac                                    36
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